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TEAM #11 FINAL PRESENTATION
Presentation Outline

- Introduction
  - About Dominic
  - Our Solution
- Treadmill weight bearing system
  - Frame
  - Weight Bearing System
  - Harness
  - Treadmill
- Budget
- Secondary Project
  - A pool lift for Zak Mahoney
- References
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TREADMILL SUPPORT SYSTEM FOR DOMINIC GONDREAU
About Dominic

- “Cerebral palsy is a group of disorders that can involve brain and nervous system functions such as movement, learning, hearing, seeing, and thinking.” [1]
- Cerebral Palsy does not allow Dominic to exercise on a daily basis.
- A safe environment for exercise presents the possibility for Dominic to gain more muscle control.
Our Solution

- Design a weight bearing system to be used with a treadmill to allow Dominic to exercise and improve muscle tone and function.
Constraints

- Design must be light weight and easy to disassemble
  - As requested by client
- Must stabilize Dominic and be able to bear his full weight
- Design must be able to slowly lift Dominic from his wheelchair
- Must support Dominic’s head and back while he exercises
- Treadmill must have 0.1mph increments
Alternative Design 1

- Linear actuator used to lift Dominic
- One main support beam to adjust height
- Problems:
  - Not rigid at base
  - Large torque generated
  - Cannot pick up Dominic from his wheelchair
Alternative Design 2

- Aluminum frame
- Utilizes pulley system to lift Dominic

Problems:
- The design is unstable in a number of places
- There is no place to attach a pulley system for a vertical lift
Our Solution
Components Overview

- **8020 Frame**
  - 1.5” x 1.5” 1515-LS cross section
  - 8020 3364 Corner mounting joints
  - Casters

- **Weight Bearing System**
  - Firgelli Automations 450-TR-24-40 Track Actuator
  - 2 Pulley System
  - Heavy Duty Cable

- **Harness**
  - Modified Rock Climbing Harness
  - Use of existing neck and back brace

- **Treadmill**
  - Exerpeutic TF1000
The Frame

- 6’ beams along base
- 6’ legs attached to base beams
- 4’ side beam for weight support system attachment
- 3’ beams on top and sides of frame supply rigidity
  - Side beams clear treadmill and Dominic in wheelchair
How it Works

- Dominic will first put on the harness
- He will then be wheeled under the weight bearing system
- The harness will then be attached to the steel cable via the carabiner
Once Dominic is in the harness and attached to the weight bearing system, he will be hoisted up and the wheelchair is removed from under him.

The weight bearing system is then wheeled over the treadmill.
Weight Support System Option 1

- ATV winch
- Easily installable
- Mechanical Locking System
- Use pulleys to cut speed significantly
- Problems:
  - The winch was too powerful and could cause injury
  - Could not provide accuracy
Weight Support System

- **Track Actuator**
  - 40” stroke
  - 24-36V
  - Light weight aluminum design
  - 450lb load capacity
  - Load Speed = 0.14-0.39 in/s

- **Includes**
  - Plug in power supply
  - Wired remote control
Wireless remote control has a RF emergency stop button which screws into the track.

When the track actuator presses this button, an RF signal shuts off the actuator.

This button will be installed at the bottom of the track actuator to provide an extra safety measure to prevent Dominic from being pulled up into the pulley system.
Cable to Actuator Fixation

- Machined plate which will attach to existing mounting hardware for attaching cable to actuator.
- Attachment via plate and carabiner (quick release clip).
Harness System

- We decided that the best way to provide neck and back support within the harness would be to use an existing neck and back brace with the harness.
- Velcro braces still allow for an easy way to put on the harness system.
The Treadmill

- Exerpeutic TF1000
  - 0.1mph increments up to 4mph
  - 20” wide belt
  - Folds up for easy storage
  - Speed/power controls on handlebars
Treadmill Support System Budget

- **Track Actuator**
  - Actuator: $209
  - Mounting Kit: $19.50
  - Wireless Remote System: $65.00

- **Cable System**
  - 3/16 x 50’ Wire Cable: $41.20
  - Pulleys: $20.00
  - Carabiners: $20.00

- **8020 Frame**: $551.84

- **Harness**:
  - Rock climbing harness: $50.00
  - Neck Brace: $17.00
  - Back Brace: $30.00

- **Treadmill**: Exerpeutic TF1000: $480.00

**TOTAL**: $1503.54
POOL LIFT FOR ZAK MAHONEY
About Zak

- Zak also has Cerebral Palsy
- He enjoys swimming in his pool, but is unable to get in and out on his own
- Swimming is a great way for Zak to exercise
- As he grows larger, his family is having a harder time to transfer him from his wheelchair into the pool, and then back out
Our Solution

- With many existing above-ground pool lifts on the market already tailored to the needs of the Mahoneys, we have decided to purchase one of these.
Constraints

- Must be able to transfer Zak directly from his wheelchair into the pool, then back to his wheelchair
- As simple as possible (i.e. no electrical components)
- Must be able to be disassembled during the winter months
- Must be corrosion-resistant
- Should mount to the client’s wood deck
- Must be able to support Zak’s weight
Pool Lift

- Triton Pool Lift
- Weight Capacity: 400lbs
- Weight: 60lbs
- Hand powered crank
- Deck mount included
- Harness attachment included
Harness System

- The harness system designed for Dominic will also work for Zak Mahoney.
- Velcro braces still allow for an easy way to put on the harness system.
Pool Lift Budget

- Lift Price: $898
- Base Mount: $168
- Harness: $100
  - Total: $1,166
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References
